
Models ESP904, ESP904E

Quad-Port Multi-Interface Ethernet Serial Server (RS-232/422/485)



Manual Documentation Number: ESP904-0504

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Chapter 1: INTRODUCTION

The **VLINX Model ESP904 Quad-Port Ethernet Serial Server** provides Ethernet to Serial connections for RS-232, RS-422 or RS-485 devices. The serial ports can be accessed over a LAN/WAN using **Direct IP Mode**, **Virtual COM Port**, or **Paired Mode** connections. The 10/100 Mbps Ethernet connection auto-selects 10BaseT or 100BaseTX and indicates the type of connection with a bi-color link light.



Figure 1. The VLINX ESP904 Quad-Port Ethernet Serial Server

Features

- **4 multi-interface serial ports** - RS-232, RS-422, RS-485; software selectable connections
- **10/100 Mbps Ethernet** with Auto Selection
- **LAN and WAN Communications**
- **Web Server**
- **TCP or UDP Client or Server operation** - configurable
- **Software Support** - Windows 98/ME/2000/XP or NT 4.0
- **Firmware Upload** for Future Revisions/Upgrades
- **VLINX ESP Manager Software for Windows** - allows easy configuration of Ethernet and serial port settings. For configuration, the

ESP904 can be attached to a network or to the Ethernet port of a computer (using a crossover cable). Non-Windows users can configure it in the Console Mode using an RS-232 port, VT100 Terminal Emulation program and an RS-232 crossover cable. Telnet also can be used to access the setup configuration menu.

- **Virtual COM Driver Software for Windows** - installs a virtual COM port, viewable in the Windows Device Manager under **Ports (COM & LPT)**. Virtual COM port provides access to any of the ports on the ESP904, like any other serial port (legacy, PCI, USB or PCMCIA) on the computer. Any program running on the computer and using Windows-based COM ports can access the serial devices attached to the ESP904. The LAN becomes transparent to the serial device and the software running on the PC.
- **Heart Beat Connection** - selectable protocol ensures reliable communications in Virtual COM Port or Paired Connection modes. This feature restores the connections if communications are temporarily lost at either end due to loss of power or the Ethernet connection.

Communication Modes

The ESP904 enables communication with serial devices over a LAN or WAN. Serial devices no longer are limited to a physical connection to the PC COM port. They can be installed anywhere on the LAN using TCP/IP or UDP/IP communications. This allows traditional Windows PC software access to serial devices anywhere on the LAN/WAN network.

Direct IP Mode

Direct IP connections allow applications using TCP/IP or UDP/IP socket programs to communicate with the asynchronous serial ports on the ESP904. In this type of application the ESP904 is configured as a TCP or UDP server. The socket program running on the PC establishes a communication connection with the ESP904. The data is sent directly to and from the serial port on the server.

Virtual COM Mode

Use **Install Virtual COM** to add a driver, to provide a virtual COM port on the computer. The new COM port shows up in the Device Manager. Windows programs using standard Windows API calls are able to interface to virtual COM ports. When a program on the PC opens the new COM port, it communicates with the remote serial device connected to one of the ports on the ESP904.

After connection, the LAN is transparent to the program and serial device. Applications are able to work just as if the serial device is connected directly to a physical COM port on the computer. The virtual COM port software converts the application's data into IP packets, sends it across the network to the ESP904, which converts the IP packet back to serial data and sends the data out a serial port located on the ESP904.

To use this mode, the ESP904 must be set to either TCP/server or UDP/server with a designated communication port number. The virtual COM driver is the TCP or UDP client.

Paired Mode

Paired Mode is also called serial tunneling. In this mode any two serial devices that can communicate with a serial link will be able to communicate using two ESP904s and the LAN.

Two ESP904s are connected to a network, one configured as a TCP or UDP client and the other as a TCP/UDP server. When setting up the server the remote IP address section must contain the address of the client. This will allow the client's IP address to pass the IP address-filtering feature of the server. Conversely, the Remote IP address of the client must contain the server's IP address. Both communication port numbers must be the same.

Heart Beat

The **Heart Beat** protocol connection provides a reliable communications connection in **Virtual COM Port Mode** or with **Paired Connection Mode**. This feature restores the connection if communications are temporarily lost at either end due to loss of power or Ethernet connection.

Without this feature a device that loses a connection and stops communicating would not be able to reconnect without human intervention. A TCP data connection can be lost when there is a power failure or temporary loss of an Ethernet connection on either the client or server. If a loss occurs the Heart Beat feature will try to reconnect the TCP data connection every five seconds until communications is established again. The Heart Beat feature is available for use in **Virtual COM Port Mode** and **Paired Connection mode**. This is not available when using a UDP application.

ESP904 Quick Start Guide

Hardware Setup

Required hardware:

- A PC operating on an Ethernet LAN.
- A serial device with a RS-232 interface.
- Network and serial cables, as required.

Step 1: Connect the ESP904 to the network using a standard network cable

Step 2: Connect the ESP904 to the RS-232 serial device.

Note:

If the serial device is configured as a DCE use a straight-through serial cable. If the serial device is configured as a DTE use a crossover (null modem) cable.

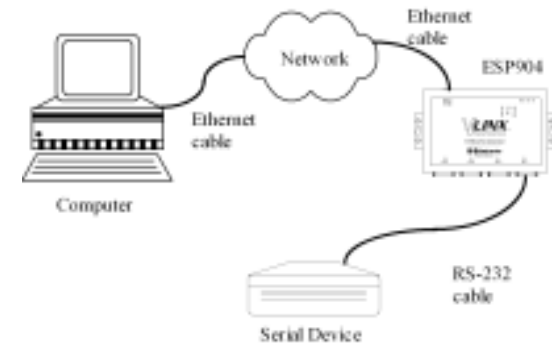


Figure 2. Quick Start Hardware Setup

Software Installation

Using the CD included with the ESP904, install the **VLINX ESP Manager** software on the configuring computer.

ESP904 Configuration

Step 1: From the Windows Start menu, run the **ESP Manager**, then double click on the **Searching Server** icon.

Step 2: In the **Search Setup** box that appears, click on **Search all reachable servers**, and **OK**, to find the ESP904 on the network.

Step 3: A list of servers will appear in the **Serial Server List** window.

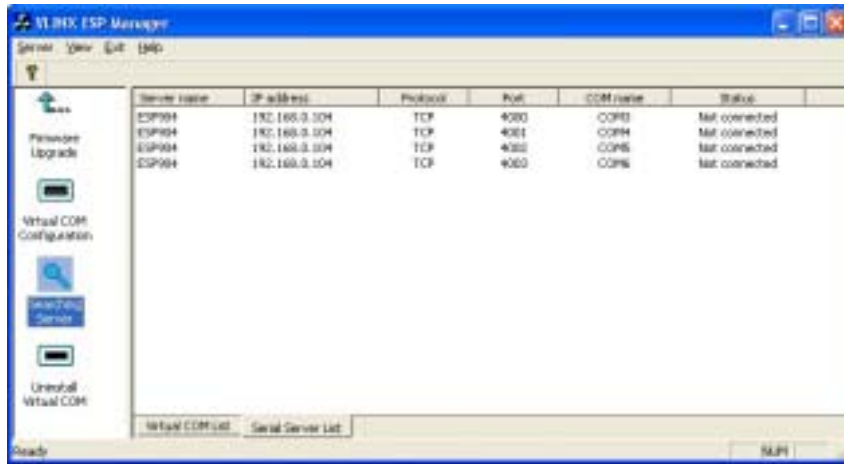


Figure 3. The ESP Manager Window

Step 4: Double click on the first ESP904 port on the list (4000) to bring up the **Server Properties** configuration screen.



Figure 4. The Server Properties Window

Step 5: Change the **Server Properties** as required.

- Enable **DHCP** to allow the ESP904 to generate its own IP address
- OR**
- Obtain appropriate static **IP**, **Netmask** and **Gateway** addresses from your Network Administrator (recommended)
 - Set the **Console Mode** property to RS-232 to match the serial device connected to the ESP904 serial port 1.
 - Set **Baud Rate**, **Data/Parity/Stop**, and **Flow Control** to match the configuration of the serial device connected to the ESP904 serial port

Step 6: When the parameters have been set, click on **Update**.

Step 7: Click on **Searching Servers**, then re-enter **Server Properties** to confirm the changes.

Install Virtual COM Ports on PC

- Step 1:** From the **Windows Start** menu, run the **Install Virtual COM Ports** utility included with the VLINX software,
- Step 2:** Search for all servers on the network
- Step 3:** Select the first port (4000) and map it to an unused COM port (e.g. Port 15). Configure it for TCP protocol and the appropriate IP address (determined in the last section).



Figure 5. Configuring the Virtual COM Port

Check Communications

- Step 1:** From the **Windows Start** menu, run **HyperTerminal**
- Step 2:** Configure **HyperTerminal** to connect using the COM port configured in the last section (e.g. Port 15).
- Step 3:** Set **Baud Rate**, **Data/Parity/Stop**, and **Flow Control** to match the configuration of the serial device connected to the ESP904 serial port.
- Step 4:** Communications with the serial device should now be operational.

ESP904 Technical Data

Hardware and Included Accessories	ESP904 Serial Server module Power Supply: 12 VDC/1A (tip positive/sleeve negative) Power Plug: (Area Dependent: North America 120VAC/60Hz, Europe/United Kingdom 220/240VAC/50Hz) Manual: Paper copy of this manual, PDF available CD-ROM disc: VLINX ESP Manager and Virtual COM Driver software for Windows 98/ME/2000/XP/NT 4.0
Dimensions	ESP904: 4.5 x 7.3 x 1.1 in (11.4 x 18.5 x 2.9 cm)
Power & Environment	Power Requirements: 12 VDC @ 500 mA Operating Temperature: 0 to 50 °C (32 to 122 °F) Storage Temperature: -20 to 60 °C (-4 to 140 °F) Humidity: 0 – 90% non-condensing Approvals: CE, FCC
Indicators	Power: Red LED Link: Yellow or green LED (10BaseT or 100 BaseTX) Ready: Flashing green LED Serial Ports (4): Flashing green LED when data present (see Ch. 2)
Connectors	Ethernet: Single RJ-45 female Serial: Four - 9 pin D-type male (DB-9M) DTE (all ports are software selectable as RS-232, 422, or 485) DC Power: Ultra-miniature phone jack (2.5mm), Tip (+), Sleeve (-)
Serial Interfaces	RS-232(DTE): TXD, RXD, RTS, CTS, DTR, DSR, DCD, GND RS-422: TXDB(+), TXDA(-), RXDB(+), RXDA(-), RTS(+), RTS(-), CTS(+), CTS(-) and GND RS-485: Data B (+), Data A (-) and GND Baud Rate: 110 bps to 230.4 k bps Parity: None, even, odd Data Bits: 7 or 8 Stop Bits: 1 or 2
Optional Accessories	232NM9 Null Modem Crossover Cable for DTE to DTE connection DRAD35 DIN Rail mounting clips for 35mm DIN Rail ERS35 one-meter length of steel 35mm DIN Rail
Memory	Serial Memory: 8K bytes per port

Network Communications	LAN:	10/100 Mbps Auto-detecting 10 BaseT or 100 BaseTX
Protocols		TCP, IP, ARP, DHCP, Telnet, HTTP, UDP, ICMP
Configuration Options	Console Mode:	Using RS-232 with VT100 emulation
	Telnet Mode:	Using VT100 emulation (software for Console Mode or Telnet not included, can use HyperTerminal in Windows)
	VLINX ESP Manager:	Using Windows 98/ME/2000/XP and NT software includes: <ul style="list-style-type: none"> - Search for VLINX ESP901 / ESP902 / ESP904 servers on network - Configure Server Properties - Add/Remove Virtual COM port in Windows - Firmware download for future revisions
Default Server Settings	Server Name	ESP904
	Serial Number:	XXXXXXXXXX
	Password:	Blank
	DHCP:	Disable
	IP Address:	192.168.0.1
	Net Mask:	255.255.255.0
	Gateway:	192.168.0.254
	MAC Address:	Fixed – see bottom label
	Port 1	Console Mode
	Ports 2, 3, 4	RS-232
	Baud Rate:	9600
	Data/Parity/Stop:	8-N-1
	Flow Control:	None
	TCP/UDP Ports:	TCP Port 1 – 4000 TCP Port 2 – 4001 TCP Port 3 – 4002 TCP Port 4 – 4003
	Connection Mode:	Server
	Remote IP Address:	255.255.255.255

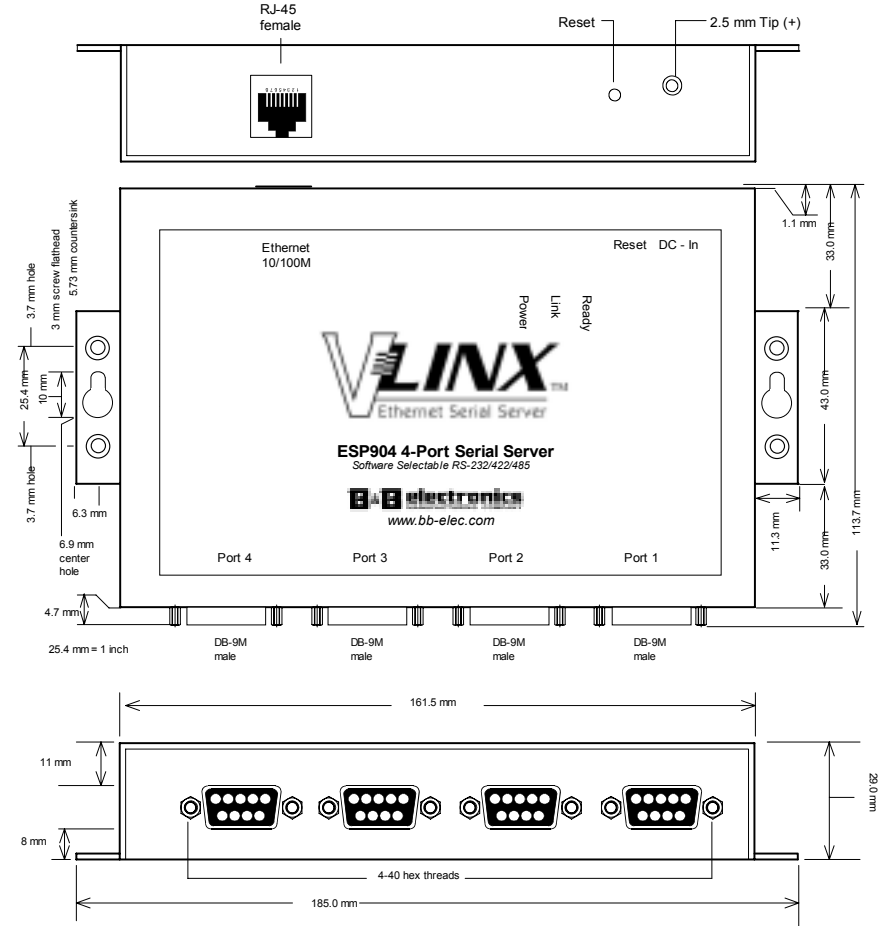


Figure 6. Dimensional Diagram of the ESP904

Chapter 2: MAKING THE HARDWARE CONNECTIONS

Package Checklist

The ESP904 4-port serial server is shipped with the following items included:

- ✓ ESP904 Serial Server Module
- ✓ Power supply
- ✓ This manual
- ✓ CD-ROM disc with manual, VLINX ESP Manager and Virtual COM Driver software for Windows 98/ME/2000/XP/NT 4.0



Figure 7. Side View of the ESP904 – when vertically mounted

ESP904 Connections, Indicators and Reset Switch

The ESP904 has:

- Seven indicator LEDs
- One Ethernet connector
- A power connector
- A recessed reset switch
- Four serial port connectors

Indicator Lights

Light	Indication
Power	Red - power is applied
Link	Yellow – 10BaseT Ethernet connection established Green – 100BaseTX Ethernet connection established
Ready	Flashing Green – system is ready
Serial (4)	<p>When set up as a TCP server:</p> <p>Steady Green - client has made a connection, communications starting</p> <p>Flashing Green – data present at serial port</p> <p>Light off – connection closed</p> <p>When setup in UDP mode:</p> <p>Steady Green (all ports)</p> <p>Flashing Green – data is being transmitted</p>

Ethernet Connector

The ESP904 has a standard RJ-45 receptacle mounted in the top edge of the chassis. The ESP904 can be connected to an Ethernet hub, switch, or wall plate using a standard straight-through RJ-45 (male) Ethernet cable. To connect directly to an RJ45 Ethernet port on a PC or laptop a crossover Ethernet cable must be used.

Note:

Refer to Appendix D for details on Network Cables

Power Connector

Plug the ultra-miniature phone plug from the included power supply into the power jack and then plug the supply in. When power is applied the Red power light will illuminate. The tip of the power plug is positive; the sleeve is negative.

Reset Button

This switch resets the unit, similar to the effect of removing/applying power. The Reset switch is recessed to avoid accidental operation. To reset the unit, insert a small plastic tool, press lightly and hold for 3 seconds. The Link and Ready lights will go out and then come back on.

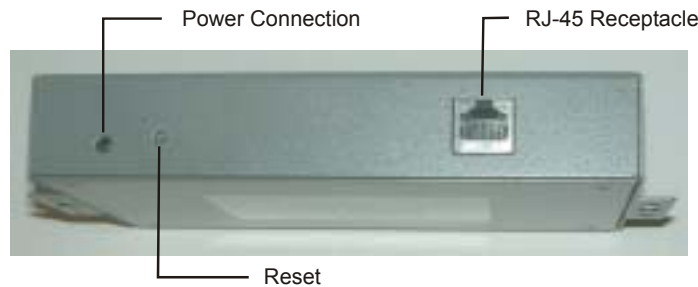


Figure 8. Top View of the ESP904

Serial Ports

The ESP904 has four serial ports, each configurable through software as RS-232, RS-422 or RS-485 interfaces. The connectors are DTE DB-9M.



Figure 9. The ESP904 Serial Port Connectors

Serial Port Operational Modes

Using the **ESP Manager** or the **Console Mode Configuration Menu** each serial port can independently be configured as **RS-232 Mode**, **RS422 Mode** or **RS-485 Mode**. Port 1 of the ESP904 also can be placed in **Console Mode**, **Upgrade Mode** or **Default Mode**. Port 1 default setting is **Console Mode**.

Default Mode

When **Default Mode** is selected and the Server Properties are **Updated (Saved)** all the configuration settings return to their default values. The default settings for the ESP904 serial ports are: **Console Mode** for Port 1; RS-232 mode for Ports 2, 3 and 4.

Note:

Refer to Chapter 5 for details on Server Configuration settings

Console Mode

In **Console Mode** the ESP904 **Configuration Menu** can be accessed from a computer by connecting its RS-232 serial port to the ESP904's Port 1. Since the computer is a DTE device, and the ESP904 serial ports are configured as DTEs (with DB-9M connectors), a null modem crossover cable must be used.

In **Console Mode** the default serial port settings are: **9600 baud**, **8 data bits**, **No parity**, and **1 stop bit**. From Windows, HyperTerminal with VT100 terminal emulation can be used for **Console Mode** configuration.

Note:

Refer to Chapter 9 for details on Console Mode

Upgrade Mode

Using a similar connection setup to that used in Console Mode, firmware for the ESP904 can be updated by connecting the ESP904 to a computer via Port 1, using RS-232. (Upgrading also can be done by communicating with the ESP904 over the network connection, using the ESP Manager software and a virtual COM port mapped to the ESP904 Port 1.)

Note:

Refer to Chapter 8 for details on Upgrade Mode

RS-232 Mode

In **RS-232 Mode** the serial port is configured to support eight RS-232 signal lines plus Signal Ground and is configured as DTE like a computer. Signals are single ended and referenced to Ground. To use handshaking, Flow Control must be set to RTS/CTS during Configuration.

Note:

Refer to Appendix A for RS-232 connection pin-outs.

RS-422 Mode

RS-422 Mode supports four RS-422 signal channels with full duplex operation for **Receive**, **Transmit**, **RTS** (Request To Send) and **CTS** (Clear To Send). The data lines are differential pairs (A & B) in which the B lines positive relative to the A lines. Ground provides a common mode reference. To use handshaking Flow Control must be set to RTS/CTS during configuration.

Note:

Refer to Appendix B RS-422 connection pin-outs.

RS-485 Mode

RS-485 Mode supports the transmit (TX) and receive (RX) signal channels using 2-wire, half-duplex operation. The data lines are differential with the Data B line positive relative to Data A in the Mark state. Ground provides a common mode reference.

Note:

Refer to Appendix C for RS-485 connection pin-outs.

RS-485 Receiver Biasing can be implemented from the ESP904 if the network does not supply it. Remove the two side-cover screws of the ESP904, slide the cover off and re-position the bias jumpers (shown open in the figure below) to enable biasing (shorting).

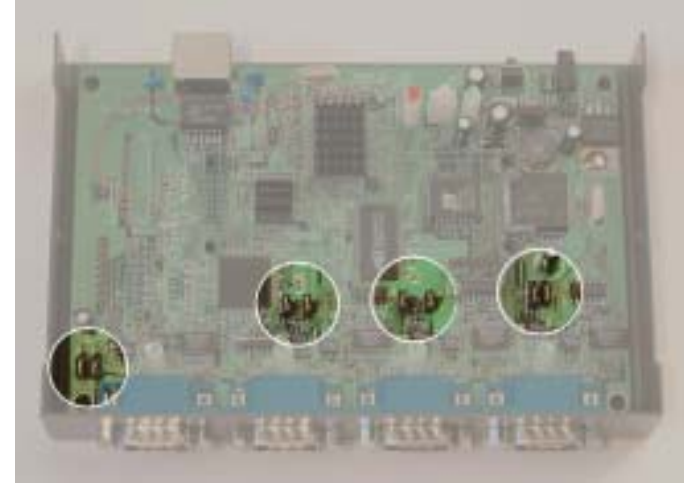


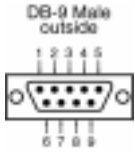
Figure 10. Internal Setting to Select RS-485 Bias

Note:

(For more information on RS-485 Receiver Biasing, see B&B Electronics RS-422/485 Application Note available at www.bb-elec.com)

ESP904 Serial Port Connector Pin-outs

Pin-outs for RS-232, RS-422 and RS-485 operation are shown below.



DB-9M Pin	RS-232 Signal Name	DTE	RS-422	RS-485	
1	Carrier Detect	DCD	In	RXDA (-)	--
2	Receive Data	RXD	In	RXDB (+)	--
3	Transmit Data	TXD	Out	TXDB (+)	Data B (+)
4	Data Terminal Ready	DTR	Out	TXDA (-)	Data A (-)
5	Signal Ground	GND	---	GND	GND
6	Data Set Ready	DSR	In	CTSA (-)	--
7	Request To Send	RTS	Out	CTSB (+)	--
8	Clear To Send	CTS	In	RTSB (+)	--
9	Ring Indicator	RI	In	RTSA (-)	

Table 11. Serial Connection Pin-outs for RS-232/RS-422/RS-485

Note:

For more information on RS-232, RS-422 and RS-485 pin-outs, cable connections and loopback connections refer to Appendices A, B and C

Chapter 3: INSTALLING THE VLINX ESP SOFTWARE

The Windows-based **ESP Manager** and **Virtual COM Port** software makes configuration fast and easy. If using Windows, installing the ESP Manager software and setting up virtual COM ports to configure the ESP904 is recommended.

Software Installation

The **VLINX ESP software** includes:

- **ESP Manager**
- **Install Virtual COM Ports**
- **Uninstall Virtual COM Ports**

Automatic Installation

Step 1a: Inserting the VLINX CD in the CD-ROM should automatically launch the Install Shield Wizard.

Manual Installation

Step 1b: To manually start the software installation, select the **Start** button on the desktop. At the Run command line type **D:\start.exe**. Then select **OK**. The D: is the drive letter for the CD Rom.

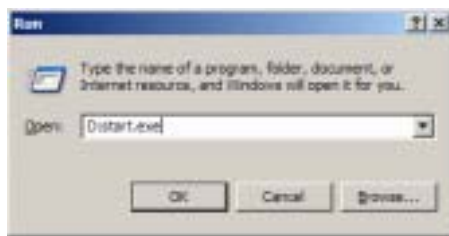


Figure 12. The Run Dialogue Box

The **Install Shield Wizard** window will be displayed.



Figure 13. The Install Shield Wizard Window

Step 2: When the **VLINX ESP Setup** window appears, click **Next**.



Figure 14. VLINX ESP Setup Window



Figure 15. The Choose Destination Window

Step 3: When Choose Destination Location appears, Click **Next**.

The installation progress will be shown until complete.



Figure 16. The Install Shield Wizard Complete Window

Step 4: Select Finish when the Install Shield Wizard Complete window appears.

After Finish, the Install window closes.

Step 5: Start the ESP Manager software:

**Start → Programs → B&B Electronics → VLINX → ESP Servers
→ VLINX ESP Manager.**

Step 6: If the ESP904 is not already connected to the network or to the Ethernet port on the computer, connect it, and then apply power.

The Power indicator should light Red, the Link light should indicate which type of Ethernet connection has been made and the Ready LED will flash indicating configuration can begin.

Chapter 4: USING ESP MANAGER

The **ESP Manager** software allows:

- Searching for servers connected to the network
- Displaying and changing the configuration of those servers
- Installing virtual COM ports on a computer
- Displaying and configuring virtual COM ports
- Uninstalling virtual COM ports on a computer
- Upgrading the ESP904 firmware

Hardware Setup:

Step 1: Connect the ESP904 to the LAN or to a computer Ethernet port.

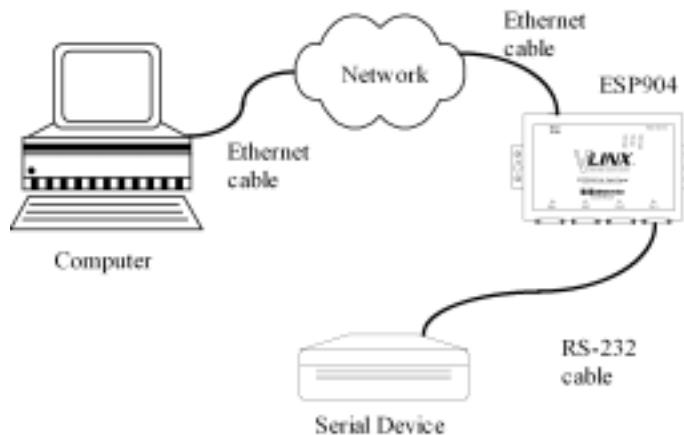


Figure 17. Ethernet Connection via a LAN

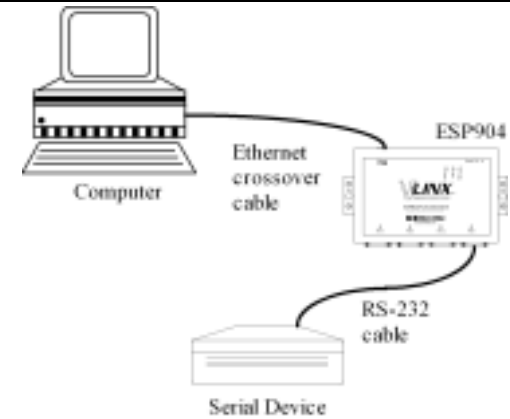


Figure 18. Direct Ethernet Connection using a Crossover Cable

Note:

Use an Ethernet Crossover Cable if connecting directly to a computer LAN card.

Step 2: Apply power. The Red Power indicator will light, the Link indicator lights when an Ethernet connection is made, and the Ready indicator will flash.

Software Setup:

Step 3: To run the **ESP Manager** from the **Programs** menu click on:

Start → Programs → B&B Electronics → VLINX → ESP Servers → VLINX ESP Manager

The following window should appear:

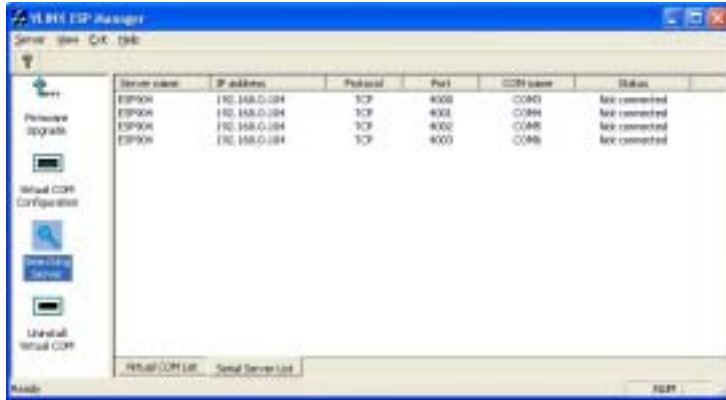


Figure 19. The VLINX ESP Manager Window

The **VLINX ESP Manager** window is divided into two sections:

The left (**Server Icons**) section displays icons used to run:

- Firmware Upgrade
- Virtual COM Configuration
- Searching Server
- Uninstall Virtual COM

The right section (**Configuration Lists**) contains two windows (selectable by tabs at the bottom of the window). These windows are the **Serial Server List** and the **Virtual COM List**.

The **Serial Server List** contains the following information:

- Server Name
- IP Address
- Protocol
- Port
- COM Name
- Status

The **Virtual COM List** contains the following information:

- COM Name
- IP Address
- Protocol
- Port
- Flow Control
- Status

Server Icons Section

Firmware Upgrade

Used when downloading new firmware to the ESP Server.

Note:

See Chapter 8 for more information on upgrading firmware.

Virtual COM Configuration

Selects the **Virtual COM List**. Double clicking on any COM port in the **Virtual COM List** brings up a window that allows changing the virtual COM settings such as **Flow Control**, **Protocol**, **IP address**, and **Port Number**. Virtual COM settings must match ESP904 port settings.

Searching Server

Searches for ESP Servers on the network and brings back configuration information that will be displayed in the **Server Properties** window.

Uninstall Virtual COM

Allows virtual COM ports to be uninstalled from the ESP Manager window.

Serial Server List

Server Name

Displays the name of the ESP904 Server. The name is listed four times, once for each port.

IP Address

Displays the IP Address for the ESP904 server. All four ports have the same the same IP address.

Protocol

Displays the currently selected TCP or UDP mode for the ESP904 server.

COM Name

Displays the number of the COM port mapped to each ESP904 port.

Status

The Status indicates the Mapped (Virtual) COM port condition.

- **Not Connected** is shown when a program does not have the port Open.
- **Connected** is shown when that Mapped port is Open for use.

Virtual COM List**COM Name**

Displays the number of the COM port mapped to each ESP904 port.

IP Address

Displays the IP Address for the ESP904 server. All four ports have the same IP address.

Protocol

Displays the currently selected TCP or UDP mode for the ESP904 server.

Port

Displays the port number for each ESP904 port.

Flow Control

Indicates what type of flow control is configured for each port.

Status

Indicates whether each port is currently **In Use** or **Not used**.

Searching Server

Step 4: To find the ESP904 on the network, click on **Searching Servers** (under the **Servers** menu or the icon on the left side of the screen). The **Search Setup** box will appear.

The **Search Setup** dialogue provides two options for searching for servers on the network:

Step 5: Enter the **IP Address** assigned to the ESP904 or click on **Search all reachable servers**, then **OK**. **IP Address** is used to find ESP904 units that are not on the same subnet. (Routers on the network will block the standard broadcast used to find servers if **Search all reachable servers** is selected.) The user must set an IP address that conforms to the LAN addressing scheme.



Figure 20. The Search Setup Window

The Searching window is shown until all active ESP901/ESP902/ESP904 serial servers on the LAN are listed in the **Serial Server List** window.

Server Properties Screen

The **Server Properties** window displays the current configuration properties for the currently selected server.

Step 6: To open the **Server Properties** window, highlight the serial server in the **Serial Server List** window, double-click to open.

The **Server Properties** window is used to configure and store the Server configuration settings. Details for setting Properties are shown in the next chapter.

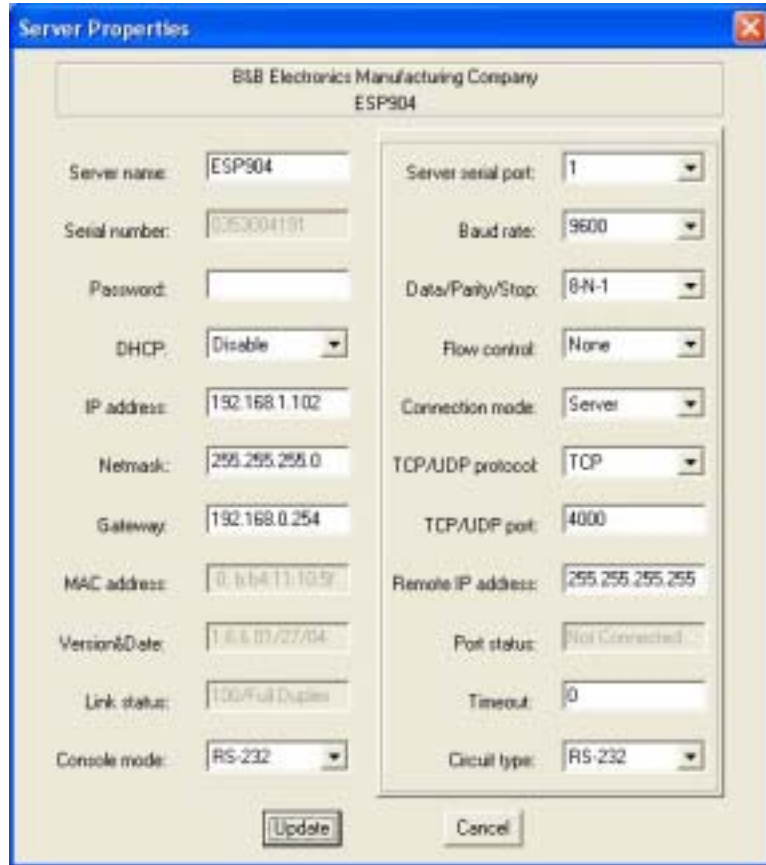


Figure 21. The Server Properties Window

Note:

ESP Manager Navigation:

- Use the mouse to select the property and parameters or
- Tab to move to the next property
- Tab+Shift to move back to previous property
- Arrows to move between properties or change values or contents of the current property
- Enter to select update or cancel

Step 7: After configuring as needed, click **Update** to store the configuration in the server. The following window will appear:

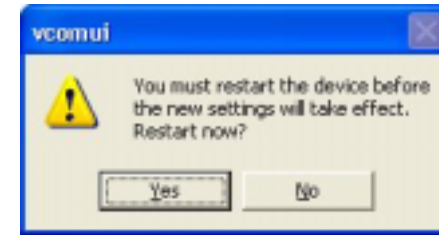


Figure 22. The vcomui Window

Step 8: Click **Yes** to restart. The server is automatically reset.

Step 9: Double click on **Searching Server** to update the information in the **Serial Server List** and verify the changes.

Chapter 5: CONFIGURING THE ESP904 SERVER PROPERTIES

The VLINX Serial Server can be configured using any of four different user interfaces: the **ESP Manager** software, the **Web Server**, **Console Mode** or **Telnet**. The **Server Properties** described in this chapter can be changed from any of these user interfaces.

Description of the Server Properties

Server Name

A new Server Name of up to 16 characters can be entered. If more than one ESP901 or ESP902 or ESP904 Servers are connected on the LAN it is recommended that a new name be assigned to each. When the ESP Manager finds ESP Servers on the LAN it displays the server name and IP Address allowing the user to distinguish between ESP servers.

Password

Entering a password activates a security feature on the serial server. Once a password is entered it will be required to access the menu and make changes.

DHCP

DHCP servers are a part of numerous LAN management systems. The DHCP field provides two choices: **Disable** and **Enable**. Disable is the normal, or default, setting. When enabled, the ESP904 will send a DHCP request to the DHCP server, which will assign a dynamic IP address, net mask, and gateway to the ESP904. If a DHCP server is not available on the network the ESP904 will time out after 10 seconds and the default values will remain.

Note:

A dynamic address assigned by the DHCP server may change if the ESP904 loses the Ethernet connection or power is removed. The host (client) communication software requests a connection to the specific IP address of the serial server. If the DHCP reassigns a different IP address the software will not be able to communicate with the hardware. Therefore, using a static IP address is recommended.

IP Address

Software or hardware attempting to access the ESP904 server via the network must know the **IP Address** of the server. A static IP address is retained and remains the same each time the server is powered up or starts/restarts. The default IP address of the ESP904 server is printed on a label on the bottom cover of the ESP904. Entering an appropriate address in the IP Address field and updating the server will change the server's IP address. The network administrator can assign/establish the static address or group of addresses to be used.

The IP Address of the ESP904 server can be confirmed using the DOS Ping command.

Note:

To use **Ping** to check for communications:

- Access a DOS window (in XP click on **Start**, then **Run**)

- At run prompt enter: **CMD**

- In the DOS window enter: **Ping xxx.xxx.xxx.xxx** (IP address for the ESP904 to be confirmed)

- The command will return the Ping results indicating 4 replies

Netmask

The default LAN netmask is configured for a Class C address. The user may change this. Default is 255.255.255.0

Gateway

The Gateway IP address allows users to access the serial server from outside the LAN.

MAC Address

The MAC address is fixed and cannot be changed. It is assigned in the factory. Every Ethernet device manufactured has its own unique MAC address.

Link Status

Link status automatically displays the type of Ethernet connection. It will either display 10BaseT or 100BaseTX in full duplex or half duplex. This will depend on the LAN, switches, hubs used in the LAN topology.

Server Serial Port (Select 1 to 4)

The configuration for each port is displayed one at a time. In the **ESP Manager**, double-click on the port in the Serial Server List. This brings up the Server Properties window for that port. Make any desired changes to the configuration and then click on Update. Only the settings for the port shown are stored.

Note:

Click Update to store settings for each port before changing to the other port.

Using **Telnet** or **Console Mode**, **Save** stores settings for all ports simultaneously.

Baud Rate

The serial port baud rate on the ESP904 must match the serial baud rate of the connected device unless using Virtual COM mode. In Virtual COM mode the software program will establish serial settings.

Data/Parity/Stop

Set this to match the data format used by the device connected when the Virtual COM mode is not being used.

Flow Control

The Flow Control setting must match the requirements of the device connected.

Note:

Select None when setting ESP Port 1 as RS-485 or 4-wire RS-422.

Connection Mode

The Connection Mode field has three options: **Server**, **Client** and **Client (no heartbeat)**

- When using the **Virtual COM Port** feature, select **Server**.
- When using a **TCP** or **UDP Socket** program, select **Server**.
- When using **Paired Mode** communication between two serial servers set up one as a **Client** and the other as a **Server**.
- When connecting to a server that does not support **Heartbeat**, select **Client (no Heartbeat)**.

TCP/UDP Protocol

Select TCP (Transmission Control Protocol) or UDP (User Datagram Protocol) protocol. If the application does not require a UDP connection, select TCP. TCP guarantees reliable communication with error checking whereas UDP provides faster transmission.

TCP/UDP Port

This sets the port number for connection. The default port number is **4000**, **4001**, **4002**, and **4003** for serial ports 1, 2, 3, and 4 respectively.

In all modes of operation, **Direct IP** or **Virtual COM**, the port number set in the ESP904 menu must match the **Virtual COM** or socket software port settings.

Note:

Example: The Virtual COM default setting is TCP/UDP Port 4000. If the port # property is changed to 4001, the virtual COM port will have to be changed to 4001. The hardware settings can be changed from the ESP Manager or Console Configuration Menu. The Virtual COM port setting also can be changed within the Device Manager of the computer on which it is installed.

Remote IP Address

This is a security feature activated by entering the IP address of the desired client. The ESP904 will only communicate with the listed IP address and all other requests for connection will be filtered out. The ESP904 must be set up as a **TCP** or **UDP Server** to use this feature. The default setting is **255.255.255.255**.

If **Paired Mode** is not being used, do not change this setting until the application has been tested and is communicating properly. Then activate the address filtering feature.

Note:

Refer to Chapter 1 Paired Mode

Timeout

Default for the Timeout property is 0, or no timeout. Setting Timeout to any value between 1 and 255 seconds activates it. If set to 5 seconds and the ESP904 is configured as a Server. In this scenario the Client makes a connection and communications start. If communications are ideal for 5 seconds the ESP904 will reset and make itself available for another client connection.

Update/Save

Updating using ESP Manager

If using the **Server Properties** screen for configuration, click the **Update** button to store the configuration settings for each serial port separately. This also resets the ESP904 Server. Click on **Searching Server** to download and confirm the new settings.

Saving using the Configuration Menu

If using the **Configuration Menu** in **Telnet** or **Console Mode**, Tab to **Save**, then press **Enter**.

There are five options shown at the bottom of the menu: **Save**, **Default**, **Running**, **Reset** and **Status**. Use Tab, Backspace, or arrow keys to move the cursor to the option position, and then press **Enter**.

- **Save** stores the configuration data to ESP904 flash memory, and resets it.
- **Default** restores the editing configuration data to factory default settings.
- **Running** restores the editing configuration data to the last values stored in the flash memory.
- **Reset** re-boots the ESP904 making it available for a client connection.
- **Status** displays how many Ethernet packets and serial bytes are transmitted and received. A refresh button is available to update the displayed figures.
- **Refresh/Space Bar**: Press to refresh the configuration page

Saving using the Web Server Interface

- Operates the same as the Configuration Menu except it does not have the **Status** feature.

Chapter 6: INSTALLING VIRTUAL COM PORTS

The Virtual COM Port feature allows Windows platform software, using standard API calls, to be used in an Ethernet application.

The Install Virtual COM port software adds an ESP904 (COM#) port to the computer. This shows up in the Device Manager. The COM number can be selected from a list of available numbers. For example, in a computer already having a COM1 and COM2, COM3 to COM 254 is available for the ESP904. It is recommended that COM Port 5 or higher be selected. The virtual COM port looks like a standard COM port to most Windows based applications which allows the software to open a connection with the serial port located anywhere on the LAN/WAN. When using the virtual COM port the ESP904 is configured as a TCP or UDP Server.

Virtual COM Port Installation

Step 1: In Windows, select **Install Virtual COM** from the **Programs** list.

Start → Programs → B&B Electronics → VLINX → ESP Servers → Install Virtual COM

The **Search Setup** window will appear.

Step 2: Click on **Search all reachable servers** and click on **OK**.



Figure 23. The Search Setup Window

The program searches the LAN for all available ESP901/ESP902/ESP904 Serial Servers. When complete, the **Found Server** window appears and displays a list of the servers that were found.



Figure 24. The Found Server Window

Step 3: Highlight the Server at the IP Address to be mapped to a virtual COM port, then select **OK**.

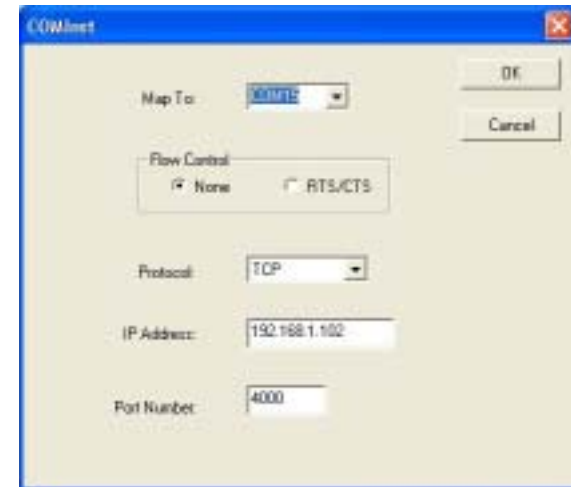


Figure 25. The COMInst Window

Windows XP provides a notice concerning Windows Logo testing for XP.



Figure 26. The Windows Logo Testing Window

This XP feature simply indicates that these drivers have not yet undergone the Microsoft testing procedures required to use the Windows XP Logo on the packaging. Driver compatibility is not affected.

Step 4: Select **Continue Anyway** to proceed with the installation.

The Protocol TCP/UDP, IP Address, and Port Number will mirror the settings of the selected serial server.

Step 5: After setting all four ESP Serial Ports as virtual COM ports, select **Cancel** on the **Found Server** form.

Note:

PCs may have hardware COM ports and devices such as Modems, IR ports or USB based COM ports that are not currently connected. Try selecting a COM number above COM4 if problems occur.

The default **Flow Control** setting is **None**. RTS/CTS can be selected if used by the application program and serial hardware. The ESP Server must be set to match.

Matching the ESP904 and Virtual COM Port Settings

The settings of the virtual COM ports in the Device Manager and the ESP904 Configuration menu must match. If the settings do not match, the virtual COM ports will not work. If these settings are changed in the Device Manager, it will only affect the operation of the virtual COM port. It will not change the settings stored in the ESP904. Use the ESP Manager to change the ESP904 Server settings.

Step 1: Use Device Manager to **View New Ports**

Confirm the virtual COM ports in the Device Manager.

Step 2: Double-click **Ports** to view the list of COM port numbers.

The installed Virtual COM port will be displayed as **VLINX ESP (COM #)**.

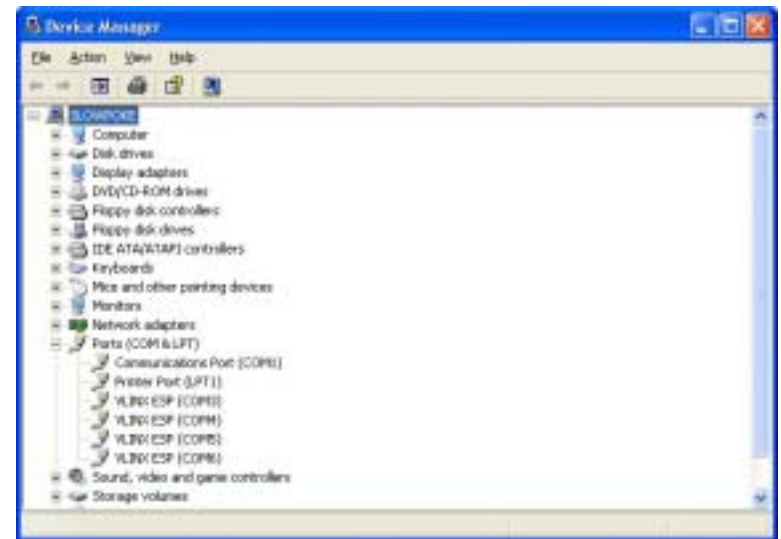


Figure 27. The Device Manager Window

Step 3: In the Device Manager select a **VLINX ESP COM#**. Double-click it to bring up the **Properties** window.



Figure 28. The VLINK ESP (COM3) Properties Window

Step 4: Select the **Configuration** or **Port Settings** tab. This screen allows the settings to be changed if necessary. Click on **Cancel** to keep the existing settings.

Step 5: Click on **OK** to change the settings. Use **Refresh** in the Device Manager if Windows does not auto refresh.

Chapter 7: REMOVING VIRTUAL COM PORTS

The ESP904 Management software **Uninstall Virtual COM Port** feature will remove a mapped COM port in the Device Manager of Windows 2000 and XP operating systems. It may also be removed in the Device Manager of Windows 98, ME, NT, 2000, and XP. Windows 98 users also will find a **Remove Virtual COM** feature in the Programs file.

Removing the Virtual COM port with ESP904 Manager

Step 1: In Windows, select VLINX ESP Manager from the **Programs** list.

Start → **Programs** → **B&B Electronics** → **VLINX** → **ESP Servers** → **VLINX ESP Manager**

Step 2: In the **ESP Manager** window select the **Virtual COM List** tab. Highlight the mapped COM port number to be removed.

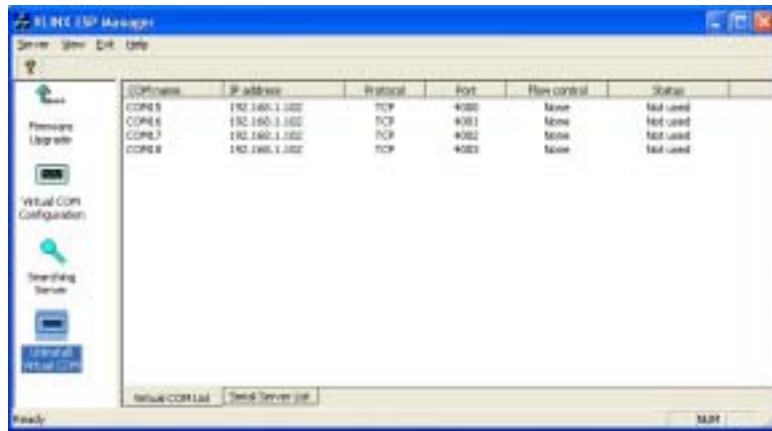


Figure 29. The ESP Manager Window

Step 3: Select **Uninstall Virtual COM** button. The Manager will ask for conformation. Select **OK** to complete the uninstall procedure.



Figure 30. The vcomui Dialogue Box

Removing the Virtual COM Port using Device Manager

Note:

The screen shots were taken from a Windows XP operating system

Step 1: On the **Desktop** select **Start** → **Settings** → **Control Panel**.

Step 2: Select the **System** icon when the manager window opens.

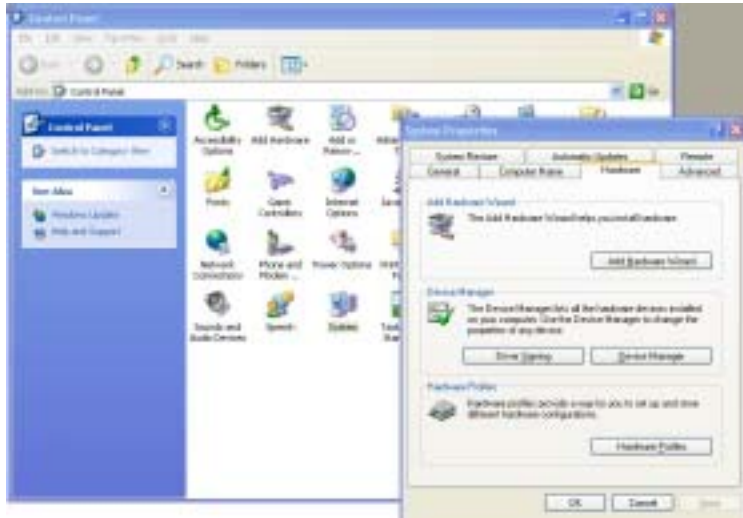


Figure 31. The Control Panel Window

Step 3: Select Device Manager in the **Systems Properties** window. In the Device Manager window select the + next to **Ports (COM LPT)** to expand.

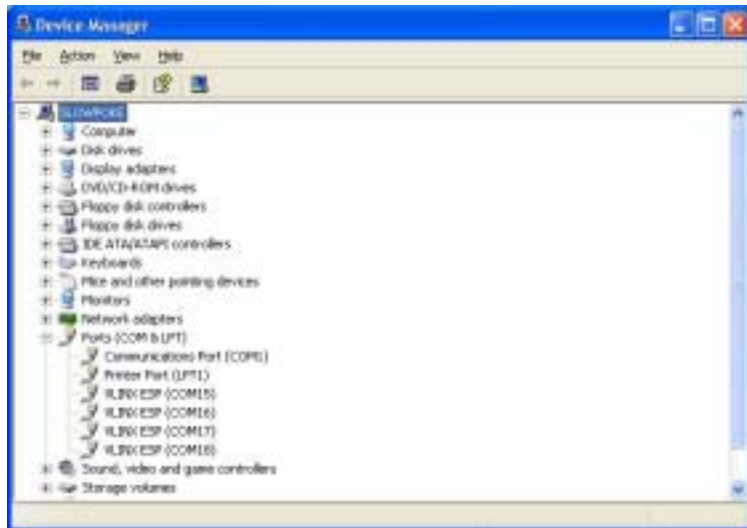


Figure 32. The Device Manager Window

Step 4: Highlight **ESP904 (COM #)** to be removed, go the **Action** tab at the top of window and select **Uninstall**. A confirm **Device Removal** window will appear.

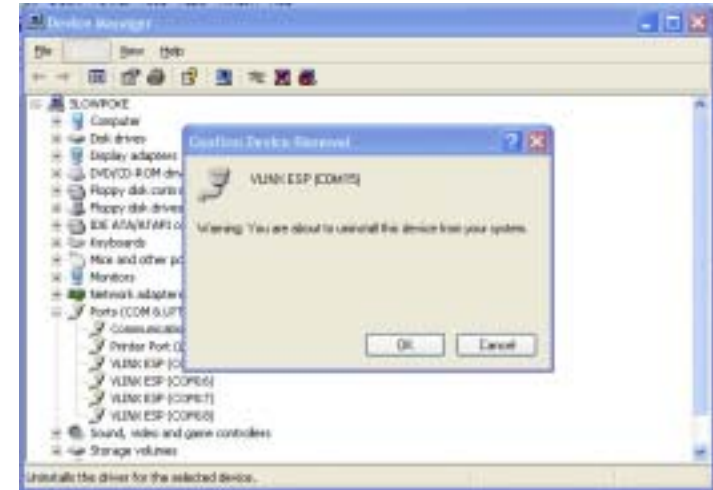


Figure 33. Confirm Device Removal

Step 5: Select **OK** to proceed.

The ESP904 COM # will be removed and the Device Manager window will refresh and display the remaining COM ports

Chapter 8: UPGRADING THE ESP904 FIRMWARE

New ESP904 firmware updates may become available through the B&B Electronics website for installation into the ESP904. The firmware can be uploaded to the ESP904 using either a virtual COM port connection or hardware COM port connection to ESP904 serial port 1.

Downloading the Firmware

Make a folder to receive the firmware file. Download the compressed software file from the B&B Electronics website. Unzip or expand the file into the (.hex) format so it will be ready to upload to the ESP904.

Upgrading Via ESP904 Manager

The ESP Manager software can upload new firmware to the server using a direct PC connection via Port 1 of the ESP904, or using a virtual COM port mapped to Port 1.

Note:

If connecting directly to a computer serial port, connect a null modem cable between the Computer RS-232 port and the ESP904 Port1 serial port.

Preparing the Software

Step 1: From the ESP Manager, in the **Serial Server List** window, double click on the server to be upgraded. The **Server Properties** window will appear.

Step 2: If using a direct connection to serial port 1 to upload the firmware to the ESP904, set the baud rate to **115.2k** for the fastest possible upload.

Step 3: Set the **Console Mode** field to upgrade and click on the **Update** button.

Step 4: Click **Yes** on the **vcomui** window to restart the ESP904.

Upgrading the Firmware

Step 5: Double-click on the **Firmware Upgrade** icon (or click on the **Server** menu and **Firmware Upgrade**)

Step 6: In the **Upgrade** window, select **Browse**. The Open dialogue box will appear. Locate the folder that contains the firmware .hex file. **Select** the file and click **Open**. The Open dialogue box will disappear.

Step 7: In the **Upgrade** window select the serial port to be used in transferring the firmware.

- If connected directly from the computer to Port 1 of the ESP904 the port will typically be COM1 or COM2
- If using a virtual COM port to upgrade via the network, identify the virtual COM number and address mapped to Port 1 on the ESP904.

Step 8: Click on **Upgrade**

Step 9: In the **Port Settings** window set the **Bits per second**, **Data bits**, **Parity** and **Stop bits** to the same values as set up in the **Server Properties** window. Click **OK**.



Figure 34. The Port Settings Window

Step 10: Upgrade progress will be shown until the **Upgrade finished!** message is shown. Select **OK**.

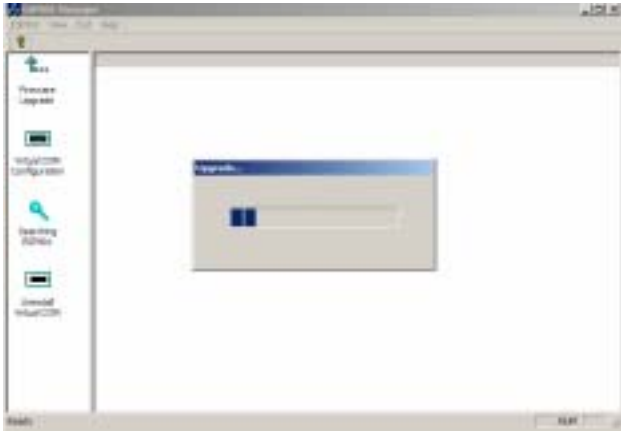


Figure 35. Upgrading in Progress

Chapter 9: USING CONSOLE MODE

Before the ESP904 is installed on a LAN the **Console Mode** can be used to change the settings from the defaults. The ESP904 is shipped with Port 1 set in the **Console Mode**. Connect a crossover (null modem) cable between the ESP904 Port1 and the COM port on the Computer.

Note:

See Chapter 5 for details of each Server Property Settings.

Console Mode Setup

Step 1: Apply power to the ESP904. The power and ready LED will light.

Step 2: Using a VT100 Terminal emulation program (typically **HyperTerminal** in Windows) open the computer COM port connected to the ESP904 Port 1 (via an RS-232 crossover cable).

Step 3: In the HyperTerminal **Port Settings** window set:

- o Baud rate: 9600
- o Data bits: 8
- o Parity: None
- o Stop bits: 1
- o Flow control: None

Click **OK**

Step 4: To view the **Configuration Menu**, press the **space bar**.

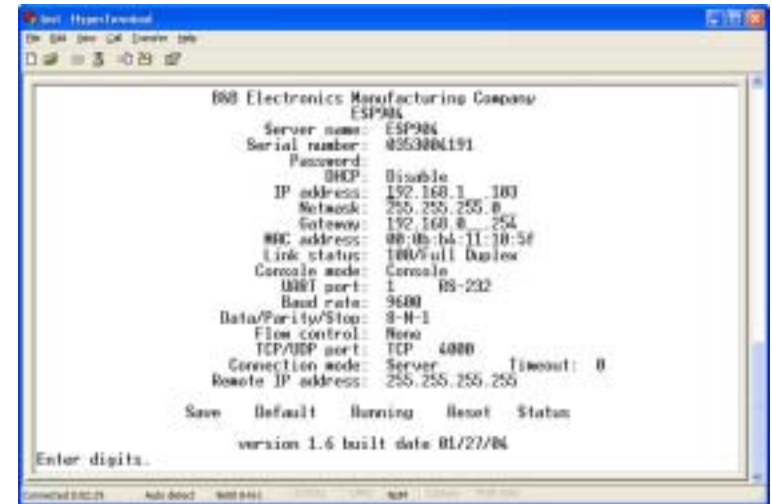


Figure 36. The Console Mode Server Configuration Screen

Navigating the Configuration Menu

Pressing the Space Bar refreshes the page. Tab, Back Space and arrow keys can be used to navigate to the desired field. The following fields can be changed by pressing **Enter** and selecting from the list that appears:

- DHCP
- IP Address
- Netmask
- Gateway
- Console mode
- UART Port
- RS-232, RS-422, RS-485
- Baud Rate
- Data/Parity/Stop
- Flow control
- TCP/UDP Port
- Connection mode
- Timeout
- Remote IP address
- Save
- Default
- Running
- Reset
- Status

Step 5: Once all the changes have been made move to the **Save** field and select **Enter**.

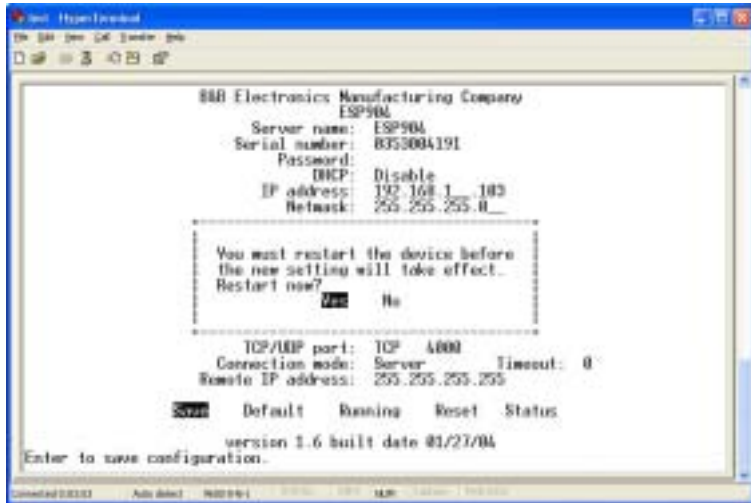


Figure 37. Saving and Restarting the Configuration

The restart message will appear.

Step 6: Select **Yes** to save changes. This is necessary to write the settings to the server.

Step 7: To view the changes press the **space bar**. The screen will reappear.

Using a Password

If a password is used it must be entered before the Configuration screen can be seen. If the server is accessed with a password but no changes are made, **Reset** to end before disconnecting.

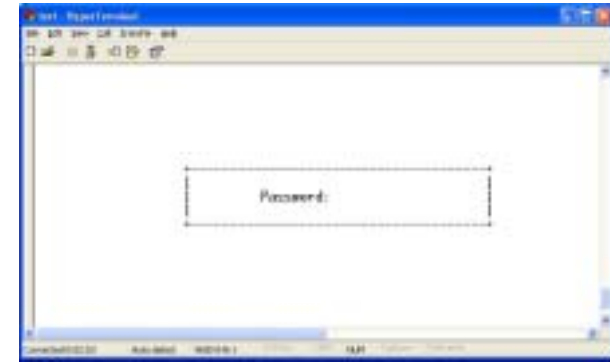


Figure 38. Assigning a Password

Chapter 10: USING THE WEB SERVER

The Web Server can be used to configure the ESP904 from any web browser software (such as Internet Explorer). Server properties can be set up using two browser pages.

Note:

See Chapter 5 for details on Server Properties.

Setting Server Properties

In Internet Explorer type the IP Address of the ESP904 into the address field near the top of the window and press **Enter**. The following window will appear:

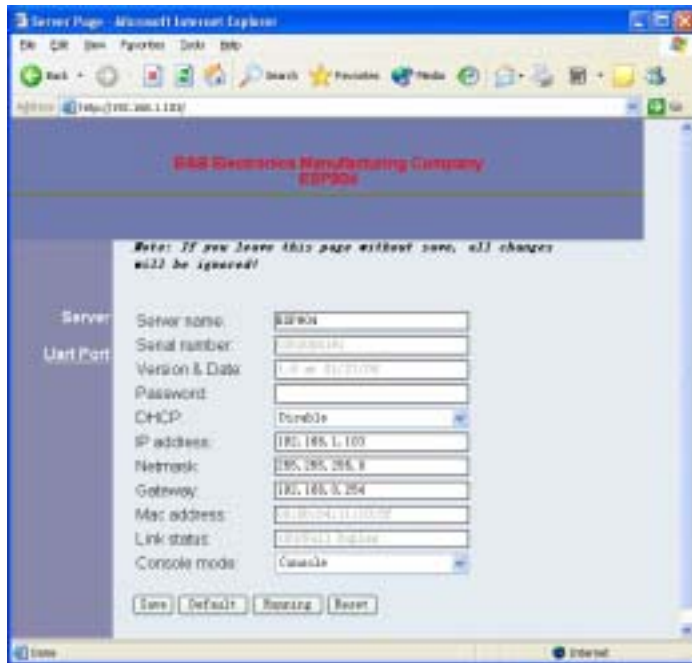


Figure 39. The Web Server Page

Navigate and change properties as required using the mouse and keyboard.

To change serial port properties, click on **Uart Port** on the left side of the browser window. The following page will appear:

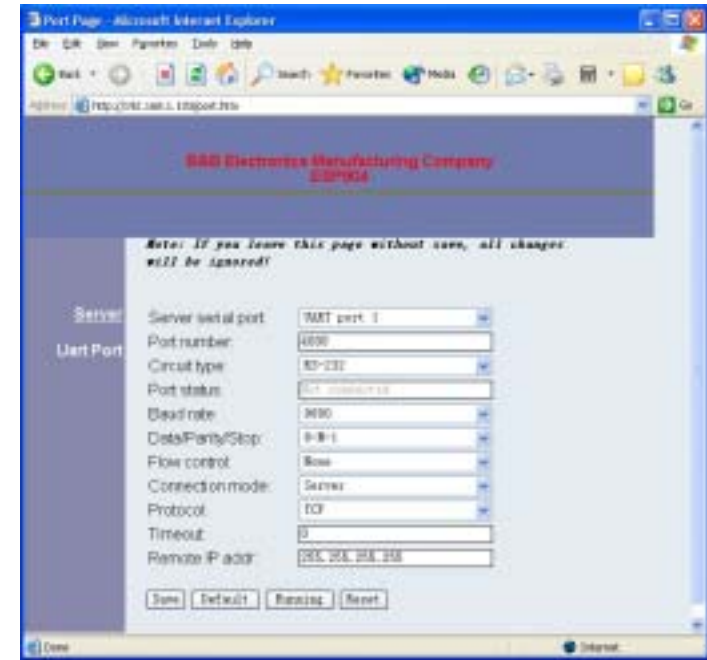


Figure 40. The Web Server Serial Port Properties Page

Click on **Save** to store changes to the ESP904. Settings for each Port must be saved separately.

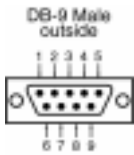
Note:

If new property settings are not **saved** before leaving this page they will not take effect.

Return to the main Server page by clicking on **Server** on the left side of the browser window.

APPENDIX A: RS-232 CONNECTIONS

ESP904 DB-9 Pin-outs in RS-232 Mode



RS-232 Signal Name	DTE	RS-232	DB-9M Pin
Carrier Detect	In	DCD	1
Receive Data	In	RXD	2
Transmit Data	Out	TXD	3
Data Terminal Ready	Out	DTR	4
Signal Ground	---	GND	5
Data Set Ready	In	DSR	6
Request To Send	Out	RTS	7
Clear To Send	In	CTS	8
Ring Indicator	In	RI	9

Figure 41. RS-232 Connections in a DB-9 Connector

RS-232 Straight-through Cable Connections

In the RS-232 mode, the ESP904's ports are configured as DTEs like a computer. If the device connected to the ESP904 is configured as a DCE use a straight through cable wired as shown below:

RS-232 Signal Names	DB-9 Pin#	Connections	DB-9 Pin#	Signal
Carrier Detect	CD	1	1	CD
Receive Data	RD	2	2	RD
Transmit Data	TD	3	3	TD
Data Terminal Ready	DTR	4	4	DTR
Signal Ground/Common	GND	5	5	GND
Data Set Ready	DSR	6	6	DSR
Request to Send	RTS	7	7	RTS
Clear to Send	CTS	8	8	CTS
Ring Indicator	RI	9	9	RI

Figure 42. Straight-through (DTE to DCE) DB-9 to DB-9 Serial Cable with RS-232 Signal Designations

RS-232 Crossover (null modem) Cable Connections

When connecting to a PC or another DTE device, use a crossover cable (also called a null modem cable).

RS-232 Signal Names	DB-9 Pin#	Connections	DB-9 Pin#	Signal
Carrier Detect	CD	1	1	CD
Receive Data	RD	2	3	RD
Transmit Data	TD	3	2	TD
Data Terminal Ready	DTR	4	4	DTR
Signal Ground/Common	GND	5	5	GND
Data Set Ready	DSR	6	6	DSR
Request to Send	RTS	7	8	RTS
Clear to Send	CTS	8	7	CTS
Ring Indicator	RI	9	9	RI

Figure 43. Crossover (DTE to DTE) DB-9 to DB-9 Serial Cable with RS-232 Signal Designations

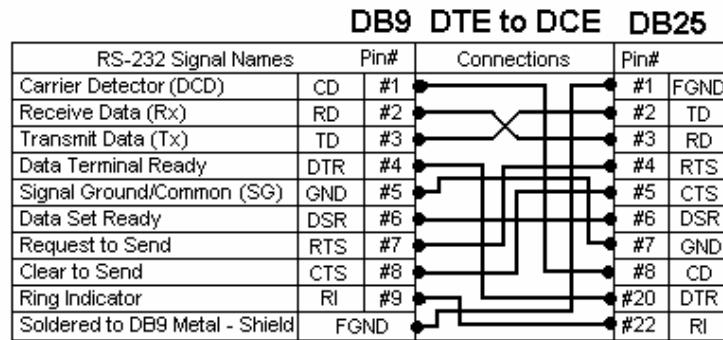
RS-232 Straight-through DB-9 to DB-25 Conversion Connections

Figure 44. Connections for a DB-9 to DB-25 Straight-through Cable

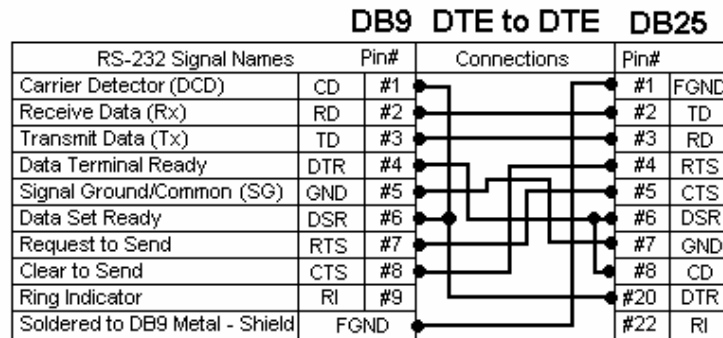
RS-232 Crossover DB-9 to DB-25 Conversion Connections

Figure 45. Connections for a DB-9 to DB-25 Crossover (null modem) Cable

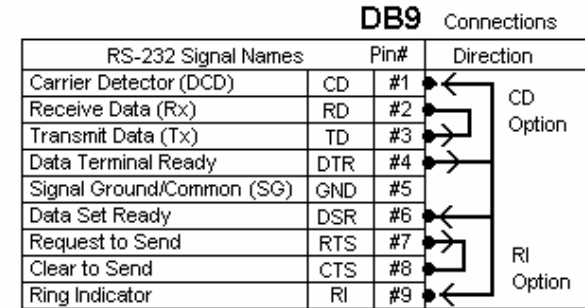
RS-232 DTE Loopback Connections

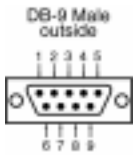
Figure 46. Loopback Connections for RS-232

For Transmit and Receive loopback, connect only those lines.

When Flow Control setting on the Serial Server is set for RTS/CTS, those lines must be looped. Usually DTR and DSR must also be looped. The Flow Control setting for the program must match the Server settings. The CD connection is needed by some terminal programs to simulate Carrier.

APPENDIX B: RS-422 CONNECTIONS

ESP904 DB-9 Pin-outs in RS-422 Mode



RS-422 Signal Name	Direction	RS-422	DB9M Pin
Receive Data A (-)	In	RXDA (-)	1
Receive Data B (+)	In	RXDB (+)	2
Transmit Data B (+)	Out	TXDB (+)	3
Transmit Data A (-)	Out	TXDA (-)	4
Signal Ground	---	GND	5
Clear to Send A (-)	In	CTSA (-)	6
Clear to Send B (+)	In	CTSB (+)	7
Request to Send B (+)	Out	RTSB (+)	8
Request to Send A (-)	Out	RTSA (-)	9

Figure 47. RS-422 Connections in a DB-9 Connector

ESP904 pin-out in RS-422 mode		DB-9 Pin#	Connections	RS-422 Device Signal
Receive A (-)	RXDA(-)	1	←	TDA(-)
Receive B (+)	RXDB(+)	2	←	TDB(+)
Transmit B (+)	TXDB(+)	3	→	RDB(+)
Transmit A (-)	TXDA(-)	4	→	RDA(-)
Ground	GND	5	●	GND
Clear to Send A (-)	CTSA(-)	6	←	RTSA(-)
Clear to Send B (+)	CTSB(+)	7	←	RTSB(+)
Ready to Send B (+)	RTSB(+)	8	→	CTSB(+)
Ready to Send A (-)	RTSA(-)	9	→	CTSA(-)

Figure 48. RS-422 Connections with Flow Control

In the RS-422 mode, TXD lines are outputs and RXD lines are inputs. Connect the ESP904 TXDB(+) line to the RXDB(+) line of the serial device, and the ESP904 TXDA(-) to the RXDA(-) of the serial device.

If Flow Control is set for RTS/CTS, connect the ESP904 RTSB(+) to CTSB(+) of the serial device and the ESP904 RTSA(-) line to the CTSA(-) of the serial device. Connect from the ESP904 CTSB(+) line to the RTSB(+) of the serial device and from the ESP904 CTSA(-) line to the RTSB(+) line of the serial device.

If connecting to Receive Only RS-422 devices, connect from the ESP904 TXDB(+) and TXDA(-) lines to the receive pairs on all serial devices.

Ground is signal ground and provides a common mode reference for the RS-422 Receiver and Transmitters.

Note:

The RS-422 mode can be used for full duplex 4-wire RS-485 operation provided that the ESP904 is acting as a sole master connecting to all the slave devices, and all slave devices share the Receive signal lines to the master. Set Flow Control for none, and omit connections to RTS/CTS line pairs.

RS-422 Mode

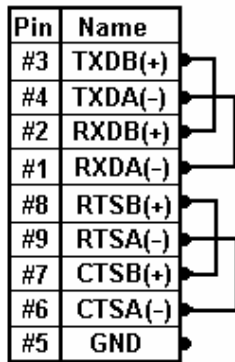


Figure 49. Loopback Connections for RS-422

The RS-485 Connections are half duplex, either Receive or Transmit, so another half duplex device must be used to check operation.

RS-422 Mode

RS-422 Device

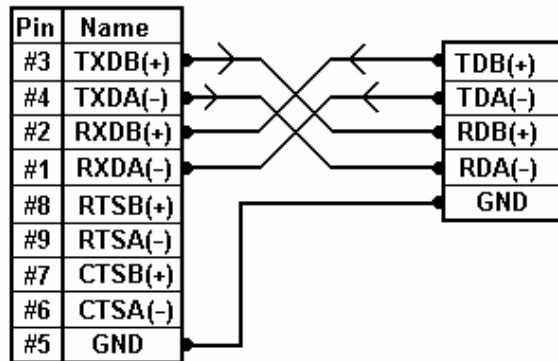


Figure 50. RS-422 Connection with No Flow Control

APPENDIX C: RS-485 CONNECTIONS

ESP904 DB-9 Pin-out in RS-485 Mode

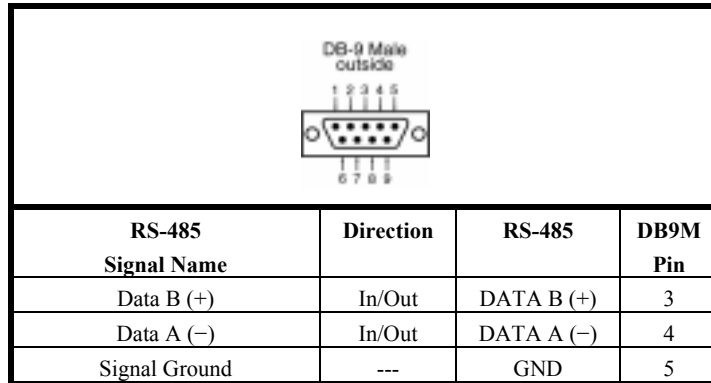


Figure 51. DB-9 Pin-out in RS-485 Mode

Note:

Some RS-485 devices are marked opposite the RS-485 standard, which defines the Data B line as positive relative to Data A during a Mark state before enabling the transmitter, and after transmitting before tri-stating. If an RS-485 device does not respond, try swapping the Data B and Data A lines.

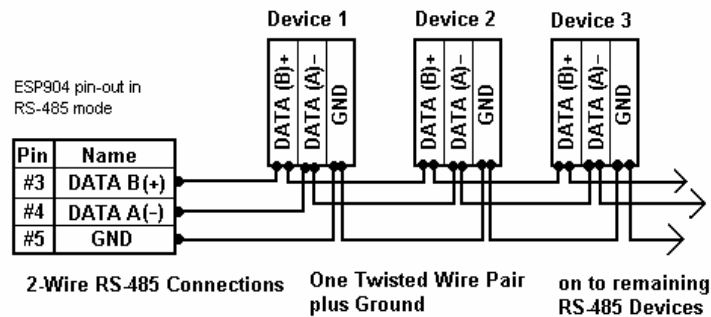
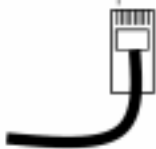


Figure 52. 2-wire RS-485 Connection

To connect 4-Wire RS-485 devices, the RS-422 Mode can be used provided the ESP904 will be connected as a master in a single master system. If using multiple masters, the ESP904 cannot be used, as it does not tri-state the transmitter in RS-422 mode.

APPENDIX D: NETWORK CONNECTIONS

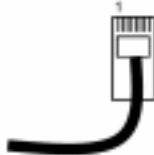
Standard Ethernet Cable RJ-45 Pin-out



RJ-45 Pin	Signal	Wire Color	RJ-45 Pin
1	TX+	White-Green	1
2	TX+	Green	2
3	RX+	White-Orange	3
4	Not used	Blue	4
5	Not used	White-Blue	5
6	RX-	Orange	6
7	Not used	White-Brown	7
8	Not used	Brown	8

Figure 53. Pin-out for a Standard Ethernet Cable

Crossover Ethernet Cable RJ-45 Pin-out



RJ-45 Pin	Signal	Wire Color	RJ-45 Pin
1	TX+	White-Green	3
2	TX+	Green	6
3	RX+	White-Orange	1
4	Not used	Blue	4
5	Not used	White-Blue	5
6	RX-	Orange	2
7	Not used	White-Brown	7
8	Not used	Brown	8

Figure 54. Pin-out for a Crossover Ethernet Cable